**Counting Atoms in Compounds or Molecules**

There are 3 important parts in a chemical formula.

2 H2O

4 Pb(OH)2

Three parts of a chemical formula are:

1. **Chemical symbols**

- Written in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. **The subscript**

- Gives the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

- Must be written \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. **The coefficient**

- Gives the number \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

- Must be written \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Rules for counting atoms in a molecule or a compound:

1. A subscript shows \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. If there is no subscript then \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(atoms of the same element)

3. If the subscript is outside the brackets then \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

are multiplied by\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. Coefficients are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ . The total number of atoms in the formula \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .

Draw and count the atoms in Ca(OH)2

Draw and count the atoms in 3 H2O

Test Yourself:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Formula | Atom 1  Present | How Many? | Atom 2 Present | How Many? | Atom 3 Present | How Many? |
| Pb(OH)4 |  |  |  |  |  |  |
| Mg3(PO3)2 |  |  |  |  |  |  |
| As(IO4)5 |  |  |  |  |  |  |
| 2Cu(ClO2)2 |  |  |  |  |  |  |

**Counting Atoms in Molecules or Compounds - 1**

For each of the compounds listed below, identify each element and the number of atom of each. Use your periodic table found in your text.

**Example:**

SnO2 Tin (Sn) – 1 atom Oxygen (O) – 2 atoms Name: Tin Oxide

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Compound** | **Element** | **# of atoms** | **Element** | **# of atoms** | **Element** | **# of atoms** |
| NaCl  (salt) |  |  |  |  |  |  |
| CaCO3  (chalk) |  |  |  |  |  |  |
| NaNO3  (fertilizer) |  |  |  |  |  |  |
| C2H4O2  (vinegar) |  |  |  |  |  |  |
| H2CO3  (formaldehyde) |  |  |  |  |  |  |
| H3COH  (methanol) |  |  |  |  |  |  |
| C6H12O6  (glucose) |  |  |  |  |  |  |
| Fe3O4  (magnetite) |  |  |  |  |  |  |

**Counting Atoms in Molecules or Compounds - 2**

For each of the compounds listed below, identify each element and the number of atom of each. Use your periodic table found in your text.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Compound** | **Element** | **# of atoms** | **Element** | **# of atoms** | **Element** | **# of atoms** |
| KCN |  |  |  |  |  |  |
| CH3COOH  Acetic acid  (vinegar) |  |  |  |  |  |  |
| TcO4 |  |  |  |  |  |  |
| CH3(CH2)2COOH  Butyric acid  (rotten smell of bad butter) |  |  |  |  |  |  |
| CH3(CH2)10COOH  Lauric acid  (found in coconut oil) |  |  |  |  |  |  |
| Sr3(PO4)2 |  |  |  |  |  |  |
| Pb(ClO3)2 |  |  |  |  |  |  |

**Counting Atoms in Molecules or Compounds - 3**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Compound** | **Element** | **# of atoms** | **Element** | **# of atoms** | **Element** | **# of atoms** |
| Al(OH)3 |  |  |  |  |  |  |
| Li2CO3 |  |  |  |  |  |  |
| Fe2(SO4)3 |  |  |  |  |  |  |
| Zn(NO3)2 |  |  |  |  |  |  |
| KClO3 |  |  |  |  |  |  |
| PbO |  |  |  |  |  |  |
| Br2 |  |  |  |  |  |  |
| Ca10(PO4)6(OH)2  Hydroxyapatite  (tooth enamel) |  |  |  |  |  |  |
| CH3COO(CH2)7CH3  Octyl lacatite  (orange aroma) |  |  |  |  |  |  |
| RbNO3 |  |  |  |  |  |  |

**Extra Challenge**

The following are the names of some of the compounds on the previous pages. See if you can match the formulas and names. **Write the formula beside the correct compound.**

***Hint:*** *The names of chemical compounds have* ***two words****. The* ***first word*** *is usually the name of the* ***first element*** *in the chemical formula. The* ***second word*** *ends in “****ide****” if there are only two elements.*

*When there is a* ***group of elements*** *in the formula, you use the special polyatomic ion names shown in the list below. The ionic charge in the upper right corner is the number of bonds the polyatomic ion wants to make.*

**Example:**

NaCl is sodium chloride Na – sodium Cl – Chloride

NaNO3 is sodium nitrate Na – sodium NO3 – nitrate

**Polyatomic Ions:** Some groups of atoms have special names including:

**OH-1 - hydroxide**

**NO3-1 - nitrate**

**SO4-2 - sulphate**

**CO3-2 - carbonate**

**CN-1 - cyanide**

**ClO3-1 - chlorate**

**PO4-3 - phosphate**

A. Bromine gas

B. Technetium oxide (used in x-rays)

C. Lithium carbonate

D. Aluminum hydroxide

E. Lead oxide

F. Zinc nitrate

G. Potassium cyanide

H. Lead chlorate

I. Rubidium nitrate

J. Strontium phosphate

K. Iron sulphate

L. Potassium chlorate